(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 4, 18-19, 23-24, and 26-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Vynne et al. (US patent 5,960,081.)

a. Vynne teaches a method of segmenting a media object for parallel watermarking operations, the method comprising:

for Claim 4

-- sub-dividing the media signal into segments based on analysis of the media signal to identify parts of media signal having signal characteristics that are more likely to carry a readable watermark signal; (Fig. 6.1; column 27, lines 7-18; The images are divided into blocks.

The media signal is sub-divided into data of a block. The data of the block consists of coded image data and motion vector of the block. As analyzed by Vynne, motion vectors are more difficult to remove in the watermarking process, as stated in column 2, lines 12-21. This makes the watermark more readable at retrieval stage.)

-- analyzing the media signal to prioritize segments of the media signal for digital watermark operations on the segments, wherein the media signal segments are prioritized for digital watermark embedding operations and wherein the media signal segments are prioritized such that segments that are more likely to carry a readable watermark signal are given higher priority for the embedding operations; (column 10, lines 32-48; column 24, line 65 to column 25, line 11; Fig. 6.1; The images are divided into blocks. A subset U(n) of blocks suitable for coding is selected using the selection criteria discussed from column 17, line 54 to column 22, line 21. The selection process is a prioritization process. column 8, lines 25-35; The blocks are selected based on energy of a block to generate more-likely readable watermark signal.; column 33, lines 19-23; The blocks can be selected also based on a secret key to generate more-likely readable watermark signal, when the watermark is under attack.)

-- distributing the prioritized segments to parallel processors; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor. Segments are prioritized in each PE. Because the blocks of the image are distributed to the PEs, the prioritized segments are inherently distributed.)

-- performing parallel digital watermark embedding operations on the prioritized segments in the parallel processors after the analyzing of the media object to prioritize the segments; (Fig. 7.2; column 26, line 1 to column 27, line 18; The analyzing is performed before

sending selected blocks for watermarking processor in each watermarking processor individually. Parallel digital watermark operations are performed on the prioritized segments after said analyzing.)

for Claims 18-19

-- sub-dividing the media signal into segments; (Fig. 6.1; column 27, lines 7-18; The images are divided into blocks.)

-- distributing the segments to parallel processors; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor.)

-- performing parallel digital watermark operations on the segments in the parallel processors (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18) wherein the media signal is segmented based on probability of watermark detection and prioritized for parallel watermark decoding operations based on probability of watermark detection; (*Column 17, lines 60-67; The image are segmented based on how probably a watermark in a block is invisible, namely detected by eyes. It is segmented based on the probability of human detection of the watermark.* column 22, line 22 to column 24, line 58; *The media signal is prioritized for parallel watermark decoding operations based on probability of watermark detection in the decoding process.)*

-- wherein the parallel processors comprise threads of execution on one or more hardware processing units; (column 26, lines 57-68; Each segment is processed separately and then combined.)

b. Vynne teaches a distributed digital watermark embedder comprising:

for Claims 23-24 and 26-28

-- a watermark signal generator for generating a watermark from a message; (column 1, lines 43-51; Fig. 6.1; column 9, lines 45-59; The part generating the signature is a watermark generator. The signature is related with author of a document or other information, which is a message. The final watermark is generated from the signature.)

-- a perceptual analyzer for perceptually analyzing a media signal and generating perceptual control parameters used to control application of the watermark to the media signal; (Fig. 6.1; "Criteria 612" is a perceptual analyzer. A subset U(n) of blocks suitable for coding is selected using the selection criteria based on perceptual analysis discussed from column 17, line 54 to column 22, line 21.)

-- a watermark applicator for receiving the media signal, the watermark and the perceptual control parameters, and for applying the watermark to the media signal according to the perceptual control parameters; wherein the watermark signal generator, the perceptual analyzer and the watermark applicator operate on distributed processors, wherein the distributed processors comprises independent threads of execution (Fig. 6.1; Fig. 7.2; column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18; Embedder 618 is a watermark applicator. Each PE of Fig. 7.2 has the set shown in Fig. 6.1.) wherein variable watermarks are embedded in copies of a media signal by executing the perceptual analyzer on the media signal once to generate a perceptual mask that is dependent on the content of the media signal and is dependent on and automatically computed from the content of the media signal and is re-used by the watermark applicator to apply different watermarks from the watermark signal generator to the

copies, the perceptual mask specifying areas of the media signal and is used to control embedding of the watermark in the areas; (column 17, line 54 to column 22, line 22; column 27, line 59 to column 28, line 10; The criteria thresholds as those listed in column 22, lines 1-9 are the mask that is used for selecting blocks for watermarking and is dependent on and automatically computed from the content of the media signal. The thresholds are adjusted based on perceptual analysis through direct view. When a block is selected, it is specified. Therefore, the perceptual mask specifying blocks of the media signal and is used to control embedding of the watermark in the blocks.)

-- including a media signal segmentation processor for sub-dividing a media signal into segments for parallel processing in the embedder, wherein the embedder includes plural perceptual analyzers, which operate in parallel on segments of the media signal and wherein the embedder includes plural watermark signal applicators, which operate in parallel on segments of the media signal. (Figs. 6.1 and 7.2; column 27, lines 7-18; The images are divided into blocks. The part generating the signature is a watermark generator. "Criteria 612" is a perceptual analyzer. Embedder 618 is a watermark applicator. Each PE of Fig. 7.2 has the set shown in Fig. 6.1.)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary

skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4, 18-24, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vynne et al. (US patent 5,960,081.)

a. Vynne teaches a method of segmenting a media object for parallel watermarking operations, the method comprising:

for Claim 4

-- sub-dividing the media signal into segments based on analysis of the media signal to identify parts of media signal having signal characteristics that are more likely to carry a readable watermark signal; (Fig. 6.1; column 27, lines 7-18; The images are divided into blocks. *The media signal is sub-divided into data of a block. The data of the block consists of coded image data and motion vector of the block. As analyzed by Vynne, motion vectors are more difficult to remove in the watermarking process, as stated in column 2, lines 12-21. This makes the watermark more readable at retrieval stage.*)

-- analyzing the media signal to prioritize segments of the media signal for digital watermark operations on the segments, wherein the media signal segments are prioritized for digital watermark embedding operations and wherein the media signal segments are prioritized such that segments that are more likely to carry a readable watermark signal are given higher priority for the embedding operations; (column 10, lines 32-48; column 24, line 65 to column 25, line 11; Fig. 6.1; The images are divided into blocks. A subset U(n) of blocks suitable for coding is selected using the selection criteria discussed from column 17, line 54 to column 22, line 21. The selection process is a prioritization process. column 8, lines 25-35; The blocks are selected

based on energy of a block to generate more-likely readable watermark signal.; column 33, lines 19-23; The blocks can be selected also based on a secret key to generate more-likely readable watermark signal, when the watermark is under attack.)

-- distributing the prioritized segments to parallel processors; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor.

Discussion A:

In column 26, line 27 to column 27, line 5, Vynne teaches the followings:

(1) Some predefined variables are used to make the execution different on the different processors. These variables also make it possible to make the system scalable; that is, to be able to run with a different number of processors without changing the C-code.

(2) Whenever two PE's want to exchange data in some way, the two PE's have to be synchronized by special commands.

It is evidently, (1) one program can direct each PE to perform different execution and (2) the PEs perform interactively with exchanging data, namely one PE can read the result of another PE to continue the task of said another PE. It is obviously that segments are prioritized in each PE and the prioritized segments are redistributed to other PEs when needed.)

-- performing parallel digital watermark embedding operations on the prioritized segments in the parallel processors after the analyzing of the media object to prioritize the segments; (Fig. 7.2; column 26, line 1 to column 27, line 18; Also see Discussion A above. The analyzing can be performed before sending selected blocks to each watermarking processor.

Parallel digital watermark operations are performed on the prioritized segments after said analyzing.)

It is desirable to make each PE's process capability scalable to optimize the operation of the parallel processor. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to select blocks in a whole image as taught by Vynne with all used PEs and redistribute the selected blocks to Vynne's parallel processors for watermarking because the combination optimizes the operation of the parallel processor of Vynne.

This modification and motivation are also applied the subsequences sections.

b. Vynne further teaches a method of segmenting a media object for parallel watermarking operations, the method comprising:

for Claims 18-19

-- sub-dividing the media signal into segments; (Fig. 6.1; column 27, lines 7-18; The images are divided into blocks.)

-- distributing the segments to parallel processors; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor. Also see Discussion A above.)

-- performing parallel digital watermark operations on the segments in the parallel processors (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18) wherein the media signal is segmented based on probability of watermark detection and prioritized for parallel watermark decoding operations based on probability of watermark detection; (*Column 17, lines 60-67; The image are segmented based on how probably a watermark in a block is*

invisible, namely detected by eyes. It is segmented based on the probability of human detection of the watermark. column 22, line 22 to column 24, line 58; *The media signal is prioritized for parallel watermark decoding operations based on probability of watermark detection in the decoding process.)*

-- wherein the parallel processors comprise threads of execution on one or more hardware processing units; (column 26, lines 57-68; Each segment is processed separately in a single PE or several PEs as explained in Discussion A above and then combined.)

for Claims 20-21

-- sub-dividing the media signal into segments; (Fig. 6.1; column 27, lines 7-18; The images are divided into blocks.)

-- distributing the segments to parallel processors; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor.)

-- performing parallel digital watermark operations on the segments in the parallel processors (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18) wherein the watermark operations are performed by two or more watermark operation modules that perform a different watermarking task, and the watermark operation modules operate in parallel such that a watermarking task foe the media signal is distributed over the watermark operation modules performing different watermark functions on the media signal in parallel wherein the different watermark functions are performed in parallel by a watermark generator that generates a signal to be embedded and a perceptual analyzer that analyzes the media signal to generate signal dependent parameters used to control embedding of the signal in the media signal; (Fig.

7.2; column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18; In column 26, lines 45-47 explicitly states that in the situation of one program, different execution is performed an different processors. Also see Discussion A above.)

-- wherein the watermark operation modules comprise a watermark generator, a perceptual analyzer and a watermark applicator. (Fig. 6.1; The part generating the signature is a watermark generator. "Criteria 612" is a perceptual analyzer. Embedder 618 is a watermark applicator. Each PE of Fig. 7.2 has the set shown in Fig. 6.1.)

In view of the Supreme Court opinion in KSR Int'l Co. v. Teleflex, Inc., NO 04-1350 (U.S. Apr. 30, 2007), it would have been obvious to one of ordinary skill in the art, at the time of the invention, to try or arrange the watermark generator to generate the signal to be embedded for a first segment on a first processor, and the perceptual analyzer to generate the signal dependent parameters for the first segment on a second processor.

c. For Claim 22, Vynne further teaches computer readable medium on which is stored instructions for performing the method of claim 20. (column 26, lines 1-54; column 27, lines 27-58; The instructions are stored in memory inside CRAY computer.)

d. Vynne teaches a distributed digital watermark embedder comprising:

for Claims 23-24 and 26-28

-- a watermark signal generator for generating a watermark from a message; (column 1, lines 43-51; Fig. 6.1; column 9, lines 45-59; The part generating the signature is a watermark

generator. The signature is related with author of a document or other information, which is a message. The final watermark is generated from the signature.)

-- a perceptual analyzer for perceptually analyzing a media signal and generating perceptual control parameters used to control application of the watermark to the media signal; (Fig. 6.1; "Criteria 612" is a perceptual analyzer. A subset U(n) of blocks suitable for coding is selected using the selection criteria based on perceptual analysis discussed from column 17, line 54 to column 22, line 21.)

-- a watermark applicator for receiving the media signal, the watermark and the perceptual control parameters, and for applying the watermark to the media signal according to the perceptual control parameters; wherein the watermark signal generator, the perceptual analyzer and the watermark applicator operate on distributed processors, wherein the distributed processors comprises independent threads of execution (Fig. 6.1; Fig. 7.2; column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18; Embedder 618 is a watermark applicator. Each PE of Fig. 7.2 has the set shown in Fig. 6.1.) wherein variable watermarks are embedded in copies of a media signal by executing the perceptual analyzer on the media signal once to generate a perceptual mask that is dependent on the content of the media signal and is dependent on and automatically computed from the content of the media signal and is re-used by the watermark applicator to apply different watermarks from the watermark signal generator to the copies, the perceptual mask specifying areas of the media signal and is used to control embedding of the watermark in the areas; (column 17, line 54 to column 22, line 22; column 27, line 59 to column 28, line 10; The criteria thresholds as those listed in column 22, lines 1-9 are the mask that is used for selecting blocks for watermarking and is dependent on and

automatically computed from the content of the media signal. The thresholds are adjusted based on perceptual analysis through direct view. When a block is selected, it is specified. Therefore, the perceptual mask specifying blocks of the media signal and is used to control embedding of the watermark in the blocks.)

-- including a media signal segmentation processor for sub-dividing a media signal into segments for parallel processing in the embedder, wherein the embedder includes plural perceptual analyzers, which operate in parallel on segments of the media signal and wherein the embedder includes plural watermark signal applicators, which operate in parallel on segments of the media signal. (Figs. 6.1 and 7.2; column 27, lines 7-18; The images are divided into blocks. The part generating the signature is a watermark generator. "Criteria 612" is a perceptual analyzer. Embedder 618 is a watermark applicator. Each PE of Fig. 7.2 has the set shown in Fig. 6.1.)

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vynne et al. (US patent 5,960,081.)

Vynne teaches in one embodiment a method of segmenting a media object for watermarking operations, the method comprising:

-- sub-dividing the media object into parts different perceptual portions within the signal, including specifying the locations of parts to be embedded with corresponding digital watermark messages and providing data used to control embedding of the corresponding digital watermarking messages in the parts; (column 24, line 65 to column 25, line 11; Fig. 6.1; column 27, lines 7-18; The images are divided into blocks. A subset U(n) of blocks suitable for coding is

selected using the selection criteria discussed from column 17, line 54 to column 22, line 21. The selection process is a prioritization process. Each segment is perceptually different from another inherently. *The data of frames are divided into parts associated with blocks, wherein each part includes the coded image data of a block and coded motion vector of the block. As evidently shown in Fig. 3.2 a block in a frame is specified by its location in the frame. Its motion vector is therefore also specified by the same location.)*

-- performing digital watermark operations on specified parts according to the data used to control the embedding. (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18; There are only two priority orders: suitable and non-suitable.)

Vynne teaches in another embodiment a method of segmenting a media object for parallel watermarking operations, the method comprising:

-- distributing image signal to parallel processors for digital watermark; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor.)

-- performing parallel digital watermark operations on the prioritized segments in the parallel processors according to the priority order of the prioritized segments; (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18; There are only two priority order: suitable and non-suitable.)

Vynne, in column 27, lines 9-10, teaches "the blocks are divided between different processors. The Examiner interpreted "the blocks" as the selected blocks. The Applicants interpreted "the blocks" as the blocks of the image prior the specifying process. For reducing the argument between the Applicants and the Examiner, the Examiner here takes the Applicants'

position. Therefore, Vynne does not teach the limitation related to "distributing the specified parts to parallel processors after specifying the locations of the parts".

Vynne teaches, in column 26, line 1 to column 27, line 5, that using parallel processing reduces the processing time. The parallel processing can be applied to various tasks. Furthermore, in column 17, line 7 to column 22, line 21, Vynne selects blocks for watermarking based on visibility concern and the criteria related to a whole frame. It has a concern of having inadequate number of selected blocks in column 17, lines 45-53. In divided segments, it is more likely to have a segment with inadequate number of selected blocks than its corresponding whole image because its size is smaller than a whole image and the numbers are not even distributed among the segments. It is desirable to have adequate number of selected blocks for watermarking an image. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to select blocks in a whole image as taught by Vynne and distribute the selected blocks to Vynne's parallel processors for watermarking because the combination reduces a complicated synchronization mechanism as pointed out by Vynne. This modification thus teaches all the limitations recited in Claim 2.

6. Claims 2, 14-16, 20, 22, 29-30 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vynne et al. (US patent 5,960,081) in view of Hawkins et al. (US patent 6,389,421.)

a. Vynne teaches in one embodiment a method of segmenting a media object for watermarking operations, the method comprising:

-- sub-dividing the media object into parts different perceptual portions within the signal, including specifying the locations of parts to be embedded with corresponding digital watermark messages and providing data used to control embedding of the corresponding digital watermarking messages in the parts; (column 24, line 65 to column 25, line 11; Fig. 6.1; column 27, lines 7-18; The images are divided into blocks. A subset U(n) of blocks suitable for coding is selected using the selection criteria discussed from column 17, line 54 to column 22, line 21. The selection process is a prioritization process. Each segment is perceptually different from another inherently. *The data of frames are divided into parts associated with blocks, wherein each part includes the coded image data of a block and coded motion vector of the block. As evidently shown in Fig. 3.2 a block in a frame is specified by its location in the frame. Its motion vector is therefore also specified by the same location.)*

-- performing digital watermark operations on specified parts according to the data used to control the embedding; (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18; There are only two priority orders: suitable and non-suitable.)

-- performed in priority order on the blocks based on an analysis of signal characteristics of the blocks for suitability of watermark embedding. (column 10, lines 32-48; column 24, line 65 to column 25, line 11; Fig. 6.1; The images are divided into blocks. A subset U(n) of blocks suitable for coding is selected using the selection criteria discussed from column 17, line 54 to column 22, line 21. The selection process is a prioritization process. column 8, lines 25-35; The blocks are selected based on energy of a block to generate more-likely readable watermark signal.)

However in this embodiment, Vynne does not teach features related to parallel processors recited in the claims.

b. Hawkins teaches a method of segmenting a media object for parallel watermarking operations, the method comprising:

for Claim 2

-- sub-dividing the media object into parts, including specifying the parts to be embedded with corresponding digital watermark messages and providing data used to control embedding of the corresponding digital watermarking messages in the parts; (column 9, lines 10-25; column 10, lines 22-61; column 12, lines 17-39; The media signal is divided based on jobs.; column 10, lines 4-62; The segments are prioritized based on the user of the media signal to set a schedule.)

-- distributing the specified parts to parallel processors after specifying of the parts to be embedded with corresponding digital watermark messages; (column 6, lines 26-34; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.)

-- performing parallel digital watermark operations on the specified parts in the parallel processors according to the data used to control the embedding. (column 6, lines 26-358; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.)

for Claims 14-15

-- sub-dividing the media object into segments; (column 9, lines 10-25; column 10, lines 22-61; column 12, lines 17-39; The media signal is divided based on jobs.)

-- distributing the segments to parallel processors; (column 6, lines 26-34; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.)

-- performing parallel digital watermark operations on the segments in the parallel processors (column 6, lines 26-358; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.) wherein the media signal is segmented into blocks based on a memory parameter of processing hardware and the parallel digital watermarking operations are performed in priority order, and the memory parameter comprises a unit of memory used to swap data into system memory in a virtual memory system; (column 10, lines 40-44; column 12, lines 25-39; The segment requested for a subsequent watermarking process depends on data-size-dependent points that is related to the characteristic of storage facility, namely the data size cannot be larger than the storage. The storage is the maximum capacity which data can be swapped for processing. A task associated with points is a block of signal. The digital watermarking operations are performed in cording to the points and thus in a priority order of the blocks.)

for Claim 20

-- sub-dividing the media signal into segments; (column 9, lines 10-25; column 10, lines 22-61; column 12, lines 17-39; The media signal is divided based on jobs.)

-- distributing the segments to parallel processors; (column 6, lines 26-34; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.)

-- performing parallel digital watermark operations on the segments in the parallel processors (column 6, lines 26-358; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.) wherein the watermark operations are performed by two or more watermark operation modules that perform a different watermarking task, and the watermark operation modules operate in parallel such that a watermarking task foe the media

signal is distributed over the watermark operation modules performing different watermark functions on the media signal in parallel. (column 6, lines 26-58; column 12, lines 17-39; A single number of watermarking process is assigned per available processor. Also see the above Examiner's responses.)

c. Hawkins points out the advantages of using multiple processors for parallel watermarking and delay problem associated with uneven distribution of watermarking processes in a multiple-processors machine. (column 3, line 60 to column 4, line 13)

It is desirable to speed up watermarking process. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to (1) treat insertion of watermark signal in one of Vynne's selected blocks of as one of Hawkins' job and (2) distribute Vynne's selected blocks according to Hawkins' teaching to Hawkins' parallel processors for parallel watermarking operations because the combination speeds up watermarking process. The combination thus teaches:

-- for Claim 20, wherein the different watermark functions are performed in parallel by a watermark generator that generates a signal to be embedded and a perceptual analyzer that analyzes the media signal to generate signal dependent parameters used to control embedding of the signal in the media signal.

For Claim 20, in view of the Supreme Court opinion in KSR Int'l Co. v. Teleflex, Inc., NO 04-1350 (U.S. Apr. 30, 2007), it would have been obvious to one of ordinary skill in the art, at the time of the invention, to try or arrange the watermark generator to generate the signal to be

embedded for a first segment on a first processor, and the perceptual analyzer to generate the signal dependent parameters for the first segment on a second processor.

d. For Claim 22, Hawkins further teaches computer readable medium on which is stored instructions for performing the method of claim 20. (See claim 20 of Hawkins)

e. For Claims 29-30 and 32-33, Hawkins teaches a system for parallel watermark embedding comprising:

-- a media signal pre-processor operable to receive a media object and divide the media object into segments for parallel watermark embedding operations; (column 9, lines 10-25; column 10, lines 22-61; column 12, lines 17-39; The media signal is divided based on jobs.)

-- a server for distributing the segments to parallel processors for parallel watermark embedding operations; (column 6, lines 26-58; column 12, lines 17-39; A single number of watermarking process is assigned per available processor.)

-- wherein the segments are prioritized for embedding operations, wherein the segments are prioritized for embedding operations based on hardware resource constraints; (column 10, lines 4-62; column 11, lines 12-26; The segments are prioritized based on a schedule. The worker thread is performed based on a resource allocation schedule which indicates hardware resource constraints.)

-- a load balancer for distributing segments to the parallel processors based on priority. (column 10, lines 4-62; column 11, lines 12-26; The segments are prioritized based on a schedule. The load balance is based on points allocated to users or size of data.)

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vynne et al. (US patent 5,960,081) in view of Kawaguchi et al. (US patent 6,473,516.)

Vynne teaches the steps of sub-dividing, distributing, and performing recited in Claim 17, as evident in the discussion above related to Claim 4.

However, it does not teach the feature related to bit planes recited in Claim 17.

Kawaguchi teaches a method of steganography which is watermarking:

-- wherein a media signal is segmented and prioritized based on bit plane to reduce the number of bit planes of the media signal subjected to watermarking operations. (column 2, lines 32-40; column 5, lines 26-37; Watermarking is done only on some bit planes.)

It is desirable to increase information hiding capacity in watermarking. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to include Kawaguchi's segmentation and prioritization method in Vynne's watermarking method, because the combination improves information hiding capacity. The combination thus teaches:

-- wherein a media signal is segmented by bit planes and the bit planes are prioritized for watermarking operations in priority order to reduce the number of bit planes of the media signal subjected to watermarking operations.

8. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinoda (US 6,611,830) in view of Vynne et al. (US patent 5,960,081.)

Shinoda teaches a batch digital watermark registration and embedding system comprising:

-- a network interface for receiving ID registration requests, the requests including a list of media signal files and information to be linked with the media signal files via data embedded in the media signal files; (Fig. 1; column 1, lines 40-46; column 3, lines 7-50; column 5, lines 1-35; Many files, each having an ID, are inputted at least one by one for registration.)

-- a batch registration loader for creating records in a registration database corresponding to identifiers for each of the media signal files; (column 4, line 64 to column 5, line 35; Fig. 5 shows records in the database.)

-- a batch registration extractor for reading the registration database and creating an embedder control file, including identifiers, a corresponding list of media signal files, and embedding instructions for controlling embedding of the identifiers in the media signal files; (column 4, line 64 to column 5, line 35)

-- a digital watermark embedder for performing digital watermark embedding operations on each file to hide the identifiers in the media signal files. (column 4, line 64 to column 5, line 46)

However, Shinoda does not teach the feature related to parallel digital water embedding.

Vynne teaches a system of segmenting a media signal for parallel watermarking operations, comprising:

-- sub-dividing the media signal into segments; (Fig. 6.1; column 27, lines 7-18; The images are divided into blocks.)

-- distributing the segments to parallel processors; (Fig. 7.2; column 26, line 1 to column 27, line 18; Fig. 7.2 shows the parallel processors. A group of B_{pe} blocks is sent to each processor.)

-- performing parallel digital watermark operations on the segments in the parallel processors. (column 10, lines 32-48; Fig. 7.2; column 26, line 1 to column 27, line 18)

It is desirable to speed up watermarking of data files. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to use Vynne's parallel watermarking approach in Shinoda's system to perform parallel watermarking for a set of files, because the combination speeds up watermarking and therefore registration process. The combination thus teaches:

-- a parallel digital watermark embedder for segmenting media signal files into segments and for distributing the segments to parallel processors for performing parallel digital watermark embedding operations on the segments to hide the identifiers in the media signal files.

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Vynne and Hawkins et al. (US patent 6,389,421) as applied to Claim 14, and further in view of Peters et al. (US patent 6,374,336.)

The combination of Vynne and Hawkins teaches the parent Claim 14. However, it does not teach the feature related to memory alignment boundary recited in Claim 16.

Peters teaches a method of watermarking:

-- wherein segmenting signals based on a memory parameter that comprises a memory alignment boundary. (column 10, lines 7-30)

It is desirable to process image at the correct division of data to reduce loss or degradation of data. It would have been obvious to one of ordinary skill in the art, at the time of

the invention, to apply Peters' teaching to segment Hawkins' data based on memory alignment boundary, because the combination preserves better data quality.